

CLAIMS

1. Method for the measurement of laser desorption mass spectra with high throughput in a time-of-flight mass spectrometer with delayed ion acceleration, *wherein* the periodic sequence of voltage pulses, in principle only necessary during a spectrum measurement, is constantly generated by a clock pulse, regardless whether a spectrum is acquired or not.
2. Method as in Claim 1, wherein the clock pulse triggers the sequence of voltage pulses directly when no spectrum is measured, and wherein during spectrum measurements the clock pulse triggers the laser, whose light pulse then triggers in turn the sequence of voltage pulses.
3. Method as in Claim 1, wherein a uniform resolving power is maintained over the entire acquisition range of the mass spectrum through time-shaping the delayed acceleration voltage pulse in the ion source.
4. Method as in Claim 1 using a precursor ion selector and a post-acceleration unit for the acquisition of daughter ion spectra, wherein the periodic sequence of voltage pulses in the precursor ion selector and in the the post-acceleration unit also operate constantly synchronous to the basic clock frequency.
5. Method as in Claim 4, wherein a delayed acceleration voltage pulse in the ion source provides time-focusing of the ions of one particular mass precisely in the precursor ion selector, and wherein the location of the time-focus is made independent of the mass by time-shaping the delayed acceleration voltage pulse.
6. Method as in Claim 5, wherein the time-shaping of the delayed acceleration voltage pulse in the post-acceleration unit achieves uniform resolving power over the whole acquisition range of the daughter ion mass spectrum.
7. Method as in Claim 4, wherein first the primary spectra of a large number of samples on a sample support are measured, the primary spectra from the samples being passed to an expert system that determines the necessity for acquisition daughter ion spectra and the associated precursor ions, and wherein the mass spectrometer is then readjusted for the measurement of daughter ion spectra and measures the daughter ion spectra from those samples where it has been found to be necessary.
8. Method as in Claims 3, wherein the time-shaping of the acceleration voltage pulses follows a simple exponential function approaching a limit value.
9. Method as in Claim 8, wherein the time-shaped acceleration voltage pulse is applied to a central electrode positioned in front of a base electrode at chassis potential.

10. Method as in Claim 8, wherein the time-shaping of the acceleration voltage pulse is created by simple R-C networks.
11. Method as in Claim 1, wherein only every second, third, or nth period of the sequence of voltage pulses is used to trigger the laser and thus to acquire a spectrum.
- 5 12. Method for the measurement of daughter ion spectra in a reflector time-of-flight mass spectrometer with a precursor ion selector between the ion source and reflector, with pulsed ionization of analyte substances on a sample support by laser desorption and with a time-shaped acceleration voltage pulse switched on after a delay, wherein the time-focus for ions of one mass created by the delay period and the accelerating field strength is located in the precursor ion selector, and wherein by rising over time the voltage of the acceleration voltage pulse, the time-focus locations for ions of different masses are located at the same point, irrespective of the mass.
- 10 13. Method as in Claim 12, wherein the voltage rise with time follows a simple exponential function approaching a limit.
- 15 14. Method as in Claim 12, wherein the ions, having passed through the precursor ion selector, are further accelerated in a post-acceleration unit.
15. Method as in Claim 14, wherein the ions are also accelerated in the post-acceleration unit by a time-shaped acceleration voltage pulse.
- 20 16. Method as in Claim 12, wherein in order to achieve and maintain electrical and thermal equilibrium in the supply units, the voltage pulse periods in the ion source, and, if applicable, in the precursor ion selector and in the post-acceleration unit are constantly repeated at a basic frequency, irrespective of whether a spectrum will be measured in the relevant period or not.
- 25 17. Method as in Claim 12, wherein selection of the precursor ions for the acquisition of daughter ion spectra is achieved by changing only the phase between the voltage periods in the ion source, the precursor ion selector and, if applicable, in the post-acceleration unit.
18. Method as in Claim 16, wherein not every period of the basic frequency is used for ionization and for acquisition a spectrum.
19. Method as in Claim 12, wherein the deflecting field in the precursor ion selector is set to zero in order to permit passage of the desired ions, and after an appropriate switching time interval, is switched to the opposite field polarity.
- 30 20. Method as in Claim 19, wherein the length of the switching time interval is chosen to be inversely proportional to the velocity of the desired ions.

21. A time-of-flight mass spectrometer in which the samples to be analyzed are ionized by laser desorption, with an electronic generator for a acceleration voltage pulse delayed in relation to the laser pulse, and with a clock generator for triggering the laser during the acquisition, wherein the clock generator can be switched between triggering the laser and directly triggering the electronic generator for the delayed acceleration pulse.
22. Time-of-flight mass spectrometer as in Claim 21, wherein a reflector and a precursor ion selector are provided, and where the delayed triggering of the precursor ion selector may also be switched between triggering by the laser pulse and direct triggering by the clock generator.
23. Time-of-flight mass spectrometer as in Claim 21, wherein a post-acceleration unit is provided for the ions, and wherein the delayed triggering of the post-acceleration unit is also be switched between triggering by the laser pulse and direct triggering by the clock generator.
24. Time-of-flight mass spectrometer as in Claim 23, wherein the precursor ion selector and the post-acceleration unit can be moved out of the path of the beam of ions.